Operation, Repair, and Parts

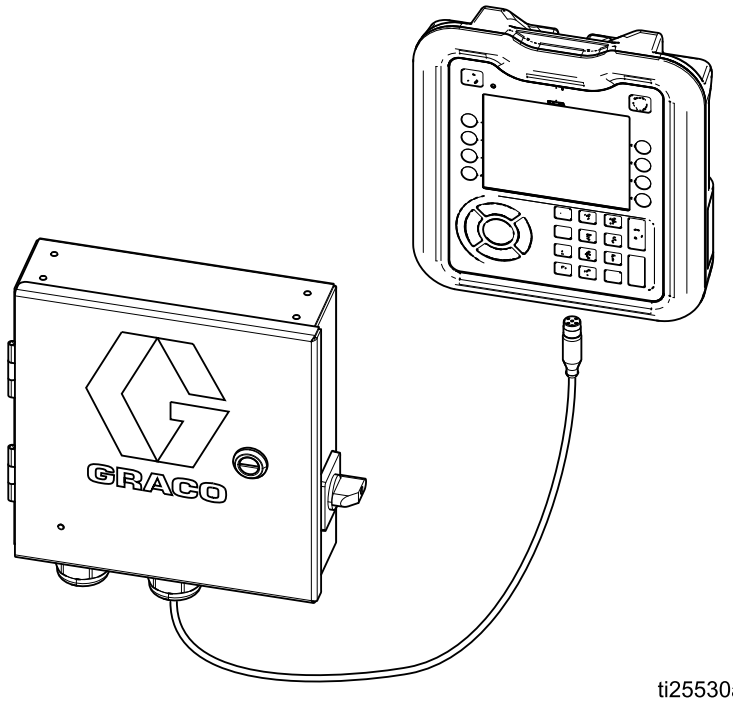
# InvisiPac® Pattern Controller

334784A
EN

**To control fluid dispense valves of adhesive supply equipment. For professional use only.**
**Not approved for use in explosive atmospheres or hazardous locations.**

Important Safety Instructions. Read all warnings and instructions in this manual and related manuals. Save these instructions.

*See page 3 for model information and Agency approvals.*




ti25530a

PROVEN QUALITY. LEADING TECHNOLOGY.

# Contents


Models ..... 3
Agency Approvals ..... 3
Related Manuals ..... 3
Warnings ..... 4
Overview ..... 7
Component Identification ..... 8
Installation ..... 9
- Mounting ..... 9
- Key Token ..... 9
- Connect Advanced Display Module (ADM) ..... 9
- Valve Installation ..... 10
- Trigger Installation ..... 10
- PLC Inputs and Outputs Installation (optional) ..... 11
- Encoder Installation (PC-8e only) ..... 12
- Run Up Installation (PC-8e only) ..... 12
- Connect Electrical Cord ..... 13

Screens ..... 14
- Screen Maps ..... 14
- HMI Interface ..... 15
- PC Screens ..... 16
- Advanced Screens ..... 27

Stitching ..... 29
- Definitions ..... 29
- Setup ..... 29

Line Speed ..... 30
Run Up Control ..... 31
- Run Up Setup ..... 31
- High Calibration Point ..... 31
- Low Calibration Point ..... 31
- User Setting Entry ..... 31
- User Settings ..... 31
- Random Length Bead Mode ..... 32
- Mirror Mode ..... 33

Calibration ..... 34
- Gun Compensation (optional) ..... 34

Verification ..... 35
- Valves ..... 35
- Triggers ..... 35
- Encoder ..... 35
- Run Up Control ..... 35
- PLC Inputs ..... 35

Troubleshooting ..... 36
- Error Codes ..... 36
- Display ..... 37
- Pattern ..... 37
- Valve ..... 38
- Trigger ..... 38
- Encoder ..... 38
- Run Up ..... 39
- PLC Inputs and Outputs ..... 39

Software Update Procedure ..... 40
USB Download ..... 41
- Download Procedure ..... 41
- Accessing Files ..... 41
- USB Logs ..... 41

Parts ..... 42
- Kits ..... 44

Wiring Diagram ..... 45
Technical Data ..... 46
Notes ..... 47
Graco Standard Warranty ..... 48

# Models

| Usage | Part | Type | Description | Contents |
|---|---|---|---|---|
| With InvisiPac | 24X523 | PC-8 | Time or distance mode, no encoder | 127971 — Pattern Controller |
| | 24X524 | PC-8e | Time or distance mode, with or without encoder<br>Run up control (optional) | 127971 — Pattern Controller<br>24X626 — Key Token for Encoder and Run up |
| Without InvisiPac | 24X525 | PC-8 | Time or distance mode, no encoder | 127971 — Pattern Controller<br>24P860 — Advanced Display Module |
| | 24X526 | PC-8e | Time or distance mode, with or without encoder<br>Run up control (optional) | 127971 — Pattern Controller<br>24P860 — Advanced Display Module<br>24X626 — Key Token for Encoder and Run up |

# Agency Approvals

| Type | Description | Contents |
|---|---|---|
| Pattern Controller | 127971 | CE, ETL, cETL |
| Advanced Display Module | 24E451 | CE, ETL, cETL |

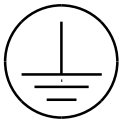
# Related Manuals

| Manual Number | Product |
|---|---|
| 333347 | InvisiPac HM25 and HM50 Tank-Free™ Hot Melt Delivery System |

# Warnings

The following warnings are for the setup, use, grounding, maintenance, and repair of this equipment. The exclamation point symbol alerts you to a general warning and the hazard symbols refer to procedure-specific risks. When these symbols appear in the body of this manual or on warning labels, refer back to these Warnings. Product-specific hazard symbols and warnings not covered in this section may appear throughout the body of this manual where applicable.

## ⚠ WARNING



**ELECTRIC SHOCK HAZARD**

This equipment must be grounded. Improper grounding, setup, or usage of the system can cause electric shock.

- Turn off and disconnect power at main switch before disconnecting any cables and before servicing or installing equipment.
- Connect only to grounded power source.
- All electrical wiring must be done by a qualified electrician and comply with all local codes and regulations.

**BURN HAZARD**

Equipment surfaces and fluid that is heated can become very hot during operation. To avoid severe burns:

- Do not touch hot fluid or equipment.

**SKIN INJECTION HAZARD**

High-pressure fluid from dispensing device, hose leaks, or ruptured components will pierce skin. This may look like just a cut, but it is a serious injury that can result in amputation. **Get immediate surgical treatment.**

- Do not point dispensing device at anyone or at any part of the body.
- Do not put your hand over the fluid outlet.
- Do not stop or deflect leaks with your hand, body, glove, or rag.
- Follow the **Pressure Relief Procedure** when you stop dispensing and before cleaning, checking, or servicing equipment.
- Tighten all fluid connections before operating the equipment.
- Check hoses and couplings daily. Replace worn or damaged parts immediately.

**MOVING PARTS HAZARD**

Moving parts can pinch, cut or amputate fingers and other body parts.

- Keep clear of moving parts.
- Do not operate equipment with protective guards or covers removed.
- Pressurized equipment can start without warning. Before checking, moving, or servicing equipment, follow the **Pressure Relief Procedure** and disconnect all power sources.

# WARNING

## EQUIPMENT MISUSE HAZARD

Misuse can cause death or serious injury.

- Do not operate the unit when fatigued or under the influence of drugs or alcohol.
- Do not exceed the maximum working pressure or temperature rating of the lowest rated system component. See **Technical Data** in all equipment manuals.
- Use fluids and solvents that are compatible with equipment wetted parts. See Technical Data in all equipment manuals. Read fluid and solvent manufacturer's warnings. For complete information about your material, request MSDS from distributor or retailer.
- Do not leave the work area while equipment is energized or under pressure.
- Turn off all equipment and follow the **Pressure Relief Procedure** when equipment is not in use.
- Check equipment daily. Repair or replace worn or damaged parts immediately with genuine manufacturer's replacement parts only.
- Do not alter or modify equipment. Alterations or modifications may void agency approvals and create safety hazards.
- Make sure all equipment is rated and approved for the environment in which you are using it.
- Use equipment only for its intended purpose. Call your distributor for information.
- Route hoses and cables away from traffic areas, sharp edges, moving parts, and hot surfaces.
- Do not kink or over bend hoses or use hoses to pull equipment.
- Keep children and animals away from work area.
- Comply with all applicable safety regulations.

## FIRE AND EXPLOSION HAZARD

Flammable fumes, such as solvent and paint fumes, in **work area** can ignite or explode. To help prevent fire and explosion:

- Do not use solvent-based adhesives that can create an explosive atmosphere when processed.
- Use equipment only in well ventilated area.
- Eliminate all ignition sources; such as pilot lights, cigarettes, portable electric lamps, and plastic drop cloths (potential static arc).
- Keep work area free of debris, including solvent, rags and gasoline.
- Do not plug or unplug power cords, or turn power or light switches on or off when flammable fumes are present.
- Ground all equipment in the work area. See **Grounding** instructions.
- Use only grounded hoses.
- **Stop operation immediately** if static sparking occurs or you feel a shock. Do not use equipment until you identify and correct the problem.
- Keep a working fire extinguisher in the work area.

## TOXIC FLUID FUMES HAZARD

Toxic fluids or fumes can cause serious injury or death if splashed in the eyes or on skin, inhaled, or swallowed.

- Read MSDSs to know the specific hazards of the fluids you are using.
- Store hazardous fluid in approved containers, and dispose of it according to applicable guidelines.

# WARNING

**PERSONAL PROTECTIVE EQUIPMENT**

Wear appropriate protective equipment when in the work area to help prevent serious injury, including eye injury, hearing loss, inhalation of toxic fumes, and burns. This protective equipment includes but is not limited to:

- Protective eyewear, and hearing protection.
- Respirators, protective clothing, and gloves as recommended by the fluid and solvent manufacturer.

**PRESSURIZED ALUMINUM PARTS HAZARD**

Use of fluids that are incompatible with aluminum in pressurized equipment can cause serious chemical reaction and equipment rupture. Failure to follow this warning can result in death, serious injury, or property damage.

- Do not use 1,1,1-trichloroethane, methylene chloride, other halogenated hydrocarbon solvents or fluids containing such solvents.
- Many other fluids may contain chemicals that can react with aluminum. Contact your material supplier for compatibility.

# Overview

InvisiPac Pattern Control systems can be integrated with InvisiPac systems or stand alone with any other equipment. For all installations, the Advanced Display Module (ADM) is used to make programming easy.

PC-8 controllers operate in time or distance mode without an encoder. Up to 8 guns and 4 independent triggers are supported.

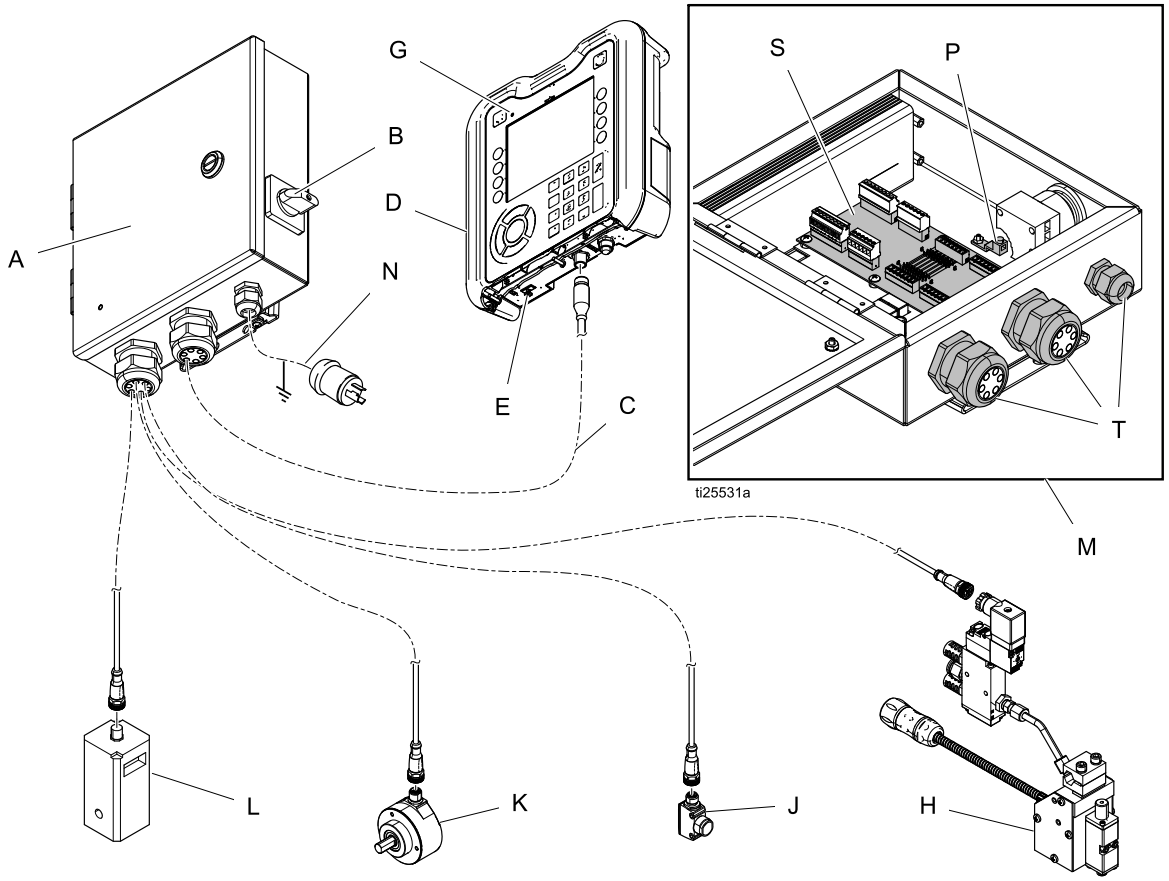
PC-8e controllers include the same features as PC-8 with the addition of distance based control using an encoder, and run up control using an I/P or V/P pressure regulator.

**Features of the PC-8 and PC-8e:**

| Feature | Details |
|---|---|
| Gun Outputs | 8 |
| Trigger Inputs | 4 |
| Encoder | 2 (PC-8e only) |
| Run Up Control | 2 (PC-8e only) |
| Program Storage | 50 |
| PLC Enable / Disable | Yes |
| PLC Alarm Output | Yes |
| PLC Program Select | Yes |
| Password Protection | Yes |
| Integrated Power Supply | Yes |

For more information, see Technical Data, page 46.

# Component Identification




**Key**

| | |
|---|---|
| A | Pattern Controller |
| B | Power Switch |
| C | Communication Cable |
| D | ADM |
| E | USB Port |
| G | Indicator Light |
| H | Valve |
| J | Trigger |

**Key**

| | |
|---|---|
| K | Encoder |
| L | Run Up |
| M | Inside View of Pattern Controller |
| N | Power Supply |
| P | Ground Terminal |
| S | Control Board |
| T | Cord Grips (I/O x2, power) |

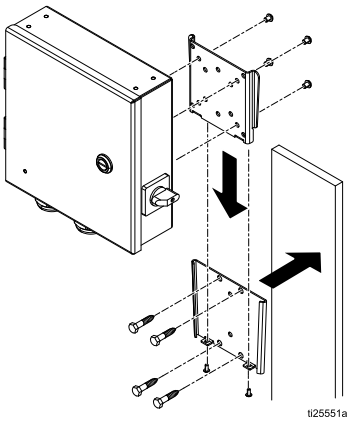
# Installation

## Mounting

The Pattern Controller and ADM can be mounted using the included VESA-compatible bracket and mounting hardware.

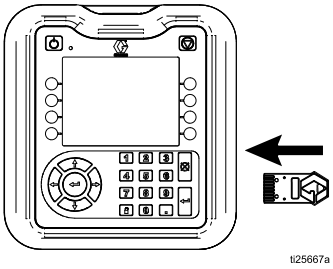
1. Unscrew the two lower screws to uncouple the “wall” portion of the bracket.
2. Securely mount the bracket in the desired location.
3. Slide the controller onto the bracket and tighten the two screws for permanent fastening.

**ALTERNATIVE METHOD:** remove mounting hardware and mount directly to any surface.



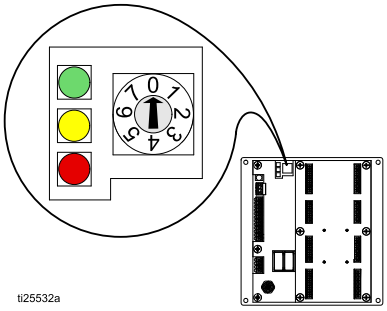

## Key Token

For PC-8e models, install the Key Token in the ADM.



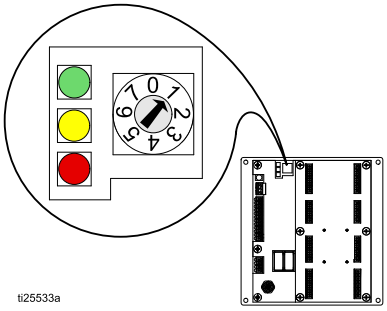

## Connect Advanced Display Module (ADM)

### Integrate with InvisiPac

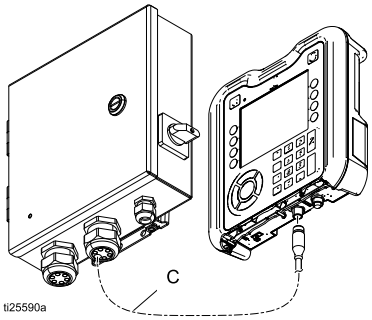



1. Set Pattern Control board dial position to 0.
2. Unplug the end of the communication cable from the ADM, then connect the short communication cable to the ADM and splitter to the end of this cable. Connect the Pattern Controller and InvisiPac communication cables to the splitter.

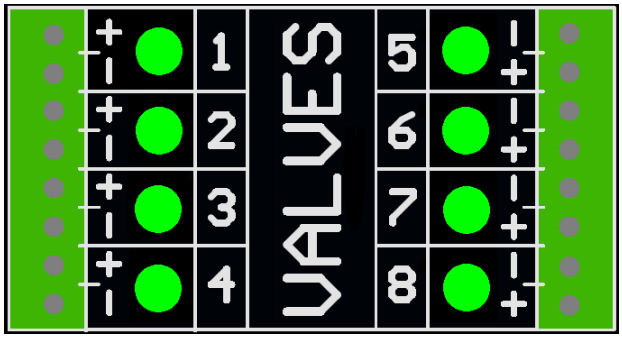
### Stand Alone




1. Set the Pattern Control board dial position to 1.
2. Mount the ADM using the provided bracket.
3. Connect the communication cable between the Pattern Controller and the ADM.



## Valve Installation



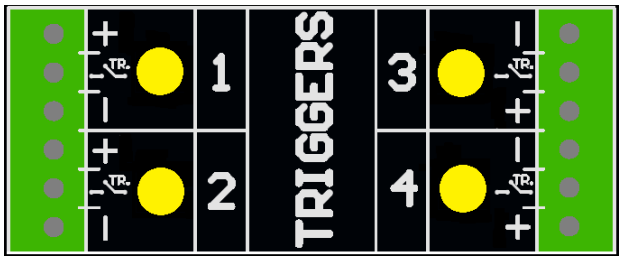

1. Connect up to 8 valves.

   **NOTE:** Control voltage is 24 VDC with a limit of 1 amp per output and 6 amps total.

   **NOTE:** Green LEDs indicate the status of each valve.

| Standard Wiring Colors | | |
|---|---|---|
| **Terminal Cable** | **Function** | **M8 or M12 Cable** |
| Plus (+) | 24V Supply | Black/Blue M12 |
| Minus ( - ) | Return | Brown/Blue M8 |

## Trigger Installation




1. Connect up to 4 NPN, PNP, or dry contact triggers.

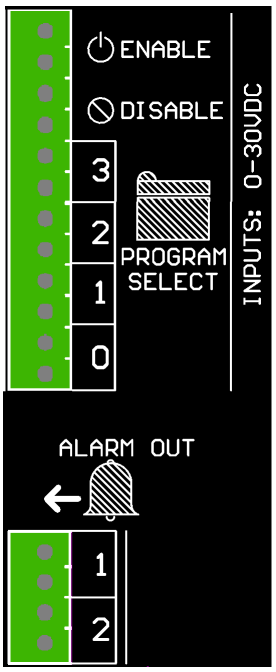
   **NOTE:** Supplied voltage (+) is 24 VDC.

2. Connect the two wires between TR and minus (-) to install a dry contact.

   **NOTE:** Yellow LEDs indicate the status of each trigger. Polarity can be inverted if needed (see Trigger Setup (Screen 3), page 23).

| Standard Wiring Colors | | |
|---|---|---|
| **Terminal** | **Function** | **M8 or M12 Cable** |
| Plus (+) | 24V Supply | Brown |
| TR | NPN, PNP, or Dry Contact | Black or White |
| Minus (-) | Return (or Dry Contact) | Blue |

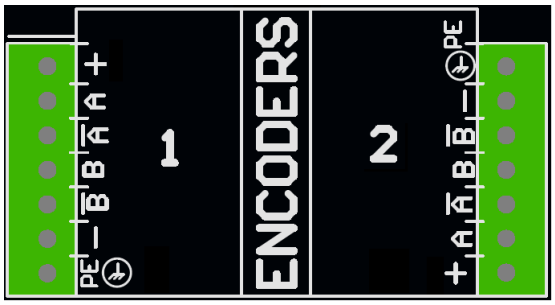
## PLC Inputs and Outputs Installation (optional)




1. Integrate with a PLC by using these inputs and outputs.
2. Inputs are bipolar and accept a 0 VDC to 30 VDC signal. Each input is electrically isolated. To connect a dry contact signal, route 24 VDC to one terminal and connect the ground through the dry contact to the other terminal.
3. Outputs are dry contact and open in the case of an alarm.

| PLC Inputs and Outputs | | | |
|---|---|---|---|
| **Type** | **Function** | **Description** | **Specs** |
| Input | ENABLE | Turns the controller on and off (rising edge enables, falling edge disables). The controller will wait for a rising edge to re-enable after an alarm or power reset. | Bipolar input<br>0–30 VDC<br>Min. 10 VDC to assert.<br>Sinks 10 mA at 24 VDC. |
| | DISABLE | Disables the controller. Pull high to disable. | |
| | PROGRAM SELECT | Bits select a program to run (1–15)<br>i.e. 1010 selects program #10<br>NOTE: 0000 disables PLC selection | |
| Output | ALARM 1 | Relay opens for active alarms on Line 1 | Dry contact output<br>0–24 VDC or 0–240 VAC<br>2A max |
| | ALARM 2 | Relay opens for active alarms on Line 2 | |

## Encoder Installation (PC-8e only)




1. Connect up to two encoders to monitor line speed. **NOTE:** These are used for Line 1 or Line 2 on the screen.

   **NOTE:** Encoder type must be quadrature differential line driver (RS422). Scaling is entered in the encoder setup screen using the live calibration feature.

   **NOTE:** Some encoders have Z and Z' connections. These are not used and do not need to be connected.

   **NOTE:** Encoder direction can be reversed by swapping A and A' with B and B'. Do this line if line speed reads negative on the display.

| Graco Encoder Wiring Diagram | | |
|---|---|---|
| **Terminal** | **Function** | **Wire Color** |
| Plus (+) | 15V Supply | Red |
| A | Phase A signal (RS422) | Brown |
| A' | Phase A signal return | White |
| B | Phase B signal (RS422) | Yellow |
| B' | Phase B signal return | Green |
| Minus ( - ) | Return | Blue |
| PE | Shield | Bare |

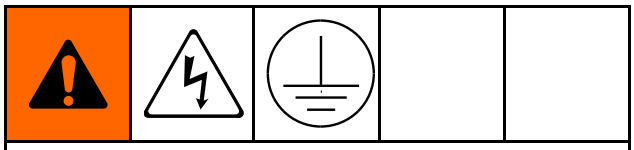
## Run Up Installation (PC-8e only)

1. Connect up to two "I/P" or "V/P" run-up air pressure regulators to vary pump pressure based on line speed. Hardware automatically detects whether an I2P or V2P is connected.

   **NOTE:** Pressure vs. line speed settings are entered on the run-up setup screen (see Run Up Control (Screens 6–7, PC–8e only), page 26).

| Standard Wire Colors | | |
|---|---|---|
| **Terminal** | **Function** | **M12 Cable** |
| Plus (+) | 24V Supply | Brown |
| % | Output to run-up | Black |
| Minus ( - ) | Return | Blue |
| Minus ( - ) | Return | White |

## Connect Electrical Cord



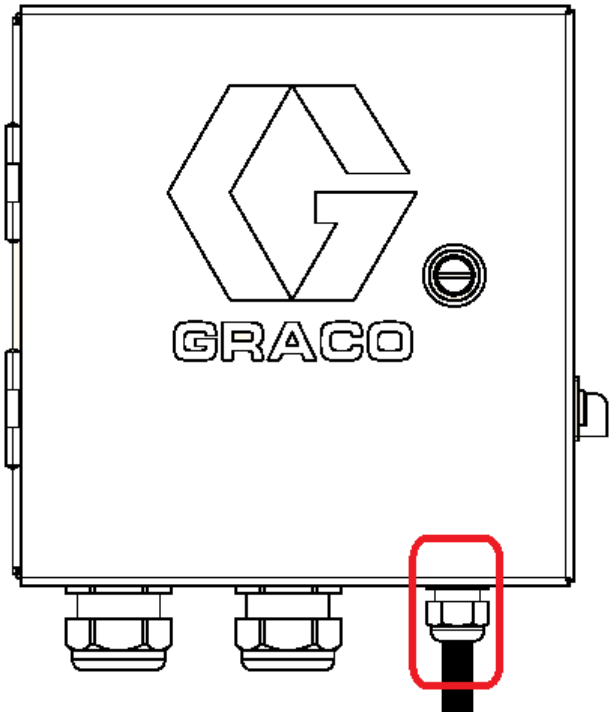
Improper wiring may cause electric shock or other serious injury if work is not performed properly. Have a qualified electrician perform any electrical work. Be sure your installation complies with all National, State, and Local safety and fire codes.

The equipment must be grounded to reduce the risk of electric shock. Improper grounding can cause electric shock. Grounding provides an escape wire for the electric current.

The InvisiPac system is equipped with a ground terminal. Have a qualified electrician ground the system using this terminal.

Electrical power enters through the smaller cord grip on the right side of the enclosure (see below). The power cord can be further secured inside the enclosure with the provided zip-tie and tie mount.

1. Install power wires (L1/L2 or L/N) into terminals 2 and 4 on the disconnect switch. The switch accepts solid or stranded 12 AWG and 14 AWG wire. For ratings, see Technical Data, page 46.
2. Connect earth ground to the grounding terminal.
3. Verify that the cord grip securely tightens around the cord. Use a wrench to tighten, if necessary.



# Screens

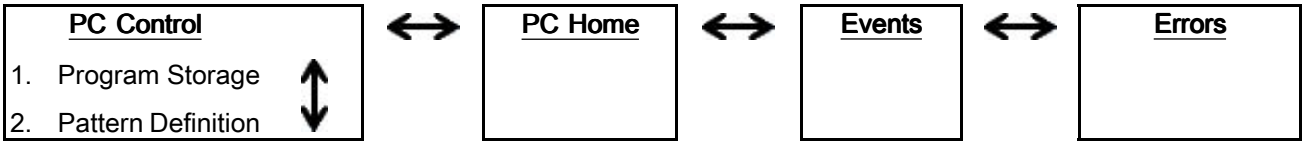
Navigate through each screen to set up the Pattern Controller interface.

- Run screens include the home page and pattern definition.
- Setup screens contain configurable settings for each accessory.

## Screen Maps

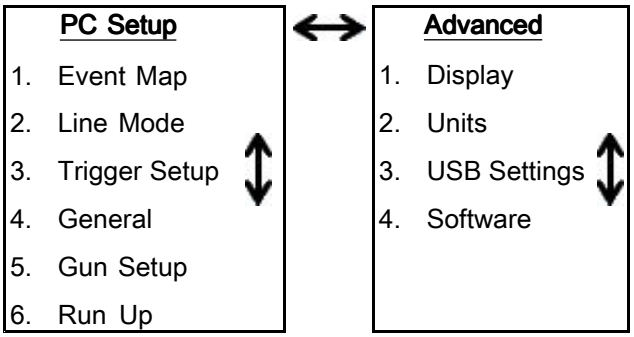
**NOTE:** On integrated InvisiPac system, additional chapters are present for hot melt HMI.

### Run Screens

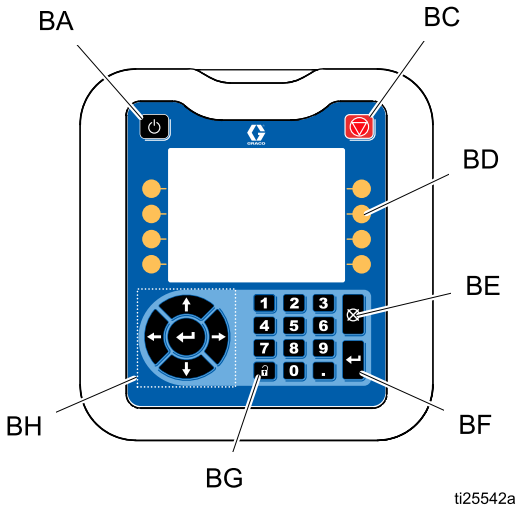


Press to switch between Run and Setup

### Setup Screens



## HMI Interface




| Key | Function |
|---|---|
| BA | Controller Enable/Disable |
| BC | Stop all system processes |
| BD | Defined by icon next to soft key |
| BE | Abort current operation |
| BF | Accept change, acknowledge error, select item, toggle selected item |
| BG | Toggle between Run and Setup screens |
| BH | Navigate within a screen or to a new screen |

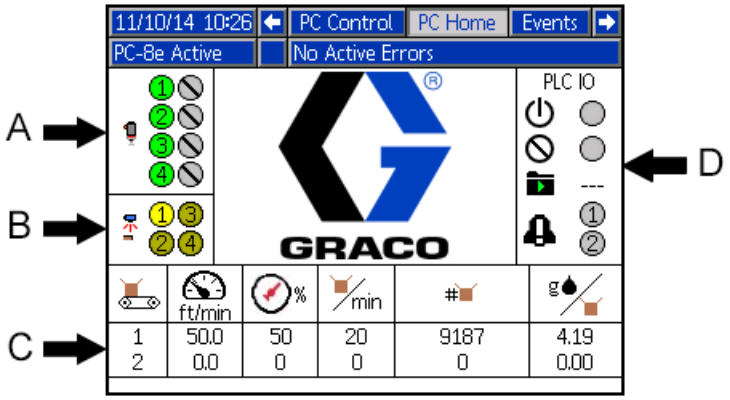
# PC Screens

## Home

Read only view of pattern controller inputs and outputs:

1. Status of guns , triggers , and PLC signals.
2. Production rate /min, and units completed #.
3. Material dispensed per product .

**A** — Gun States
**B** — Trigger States
**C** — Line Information
**D** — PLC Signals



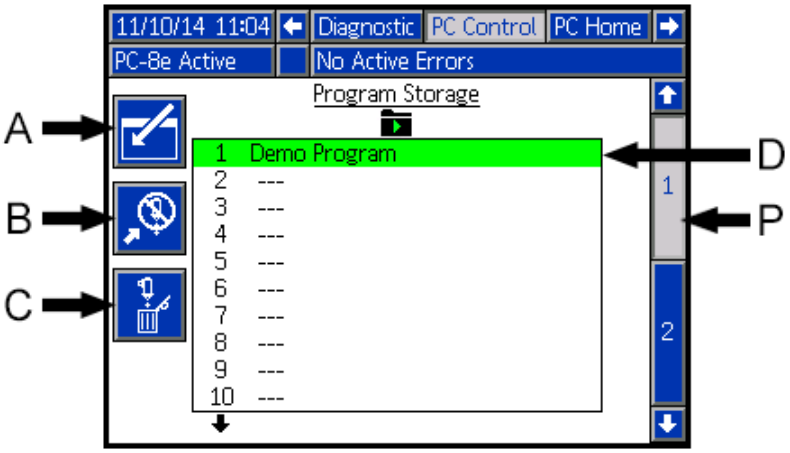

| Icon | Name | Description |
|---|---|---|
| | Gun | Gun status: Active (green), Enabled (gray), Disabled (crossed out). |
| | Trigger | Trigger Status: Active (bright yellow), Inactive (dark yellow). |
| | Line Number | Line number for other display values in row. |
| | Line Speed | Current line speed (or fixed line speed setting). |
| % | Run Up Output | Percentage of run up pressure range being output (PC-8e only). |
| | Production Rate | Number of product per minute. |
| # | Product Count | Total products completed. Same as current trigger cycle count. |
| | Glue Rate | Amount of glue per product (integrated InvisiPac systems only). **NOTE:** For best results, enter the appropriate specific gravity value for the adhesive material in use (see the InvisiPac system manual). |
| | PLC Enable | Enables/disables the pattern control via PLC. |
| | PLC Disable | Disables the system via PLC. |
| | Active Program | Displays the active program chosen by the PLC. |
| | PLC Alarm | Alarms being given to the PLC (on line 1 or 2). |

## Program Storage (Screen 1)

1. Select program to load.
2. Copy program , erase program , or rename program .
3. Purge guns .
4. Lock/unlock controller for maintenance .

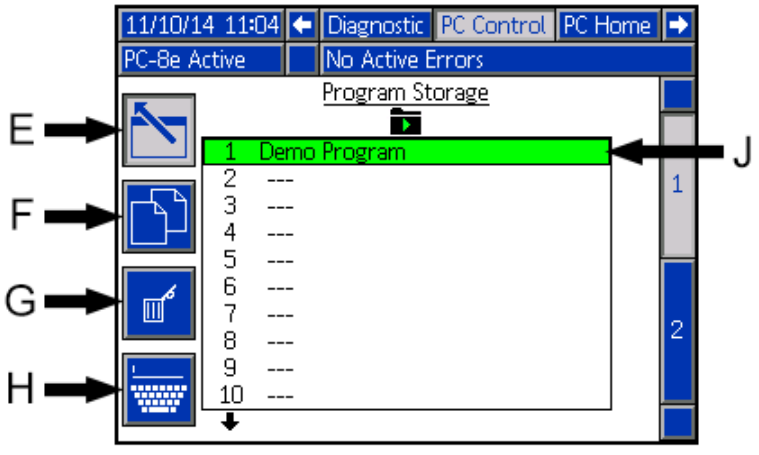
**NOTE:** Copy, erase, and rename capabilities are disabled if “Lock Pattern Definition” is enabled (see General Setup (Screen 4), page 24).

**A** — Enter Screen
**B** — Maintenance Lock / Unlock
**C** — To Purge Screen
**D** — Active Program
**P** — Screen Number (Screen 1)




| Icon | Name | Description |
|---|---|---|
| | Maintenance Lock | Press to disable Pattern Controller |
| | Maintenance Unlock | Press to enable Pattern Controller |

**E** — Exit Screen
**F** — Copy Selected
**G** — Erase Selected
**H** — Rename Selected
**J** — Press “Enter” to Select Active Program

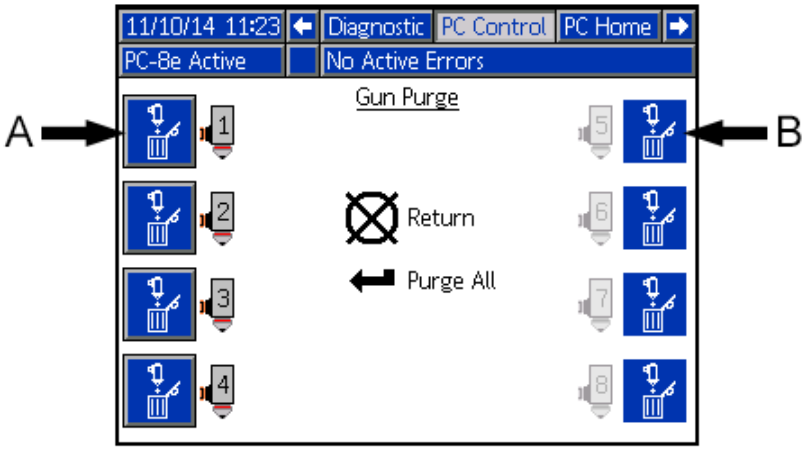


## Gun Purge

1. Purge individual guns .
2. Purge all guns by pressing enter .

**NOTE:** Only guns with assigned triggers will purge.

**NOTE:** Guns may only be purged when the system is active or within 5 minutes of the system being active.

| | |
|---|---|
| **A** — Press to Purge<br>**B** — Disabled Guns will not Purge |  |

| Icon | Name | Description |
|---|---|---|
| | Purge | Purge specific gun |
| | Enter | Purge all enabled guns |
| | Return / Cancel | Exit screen |

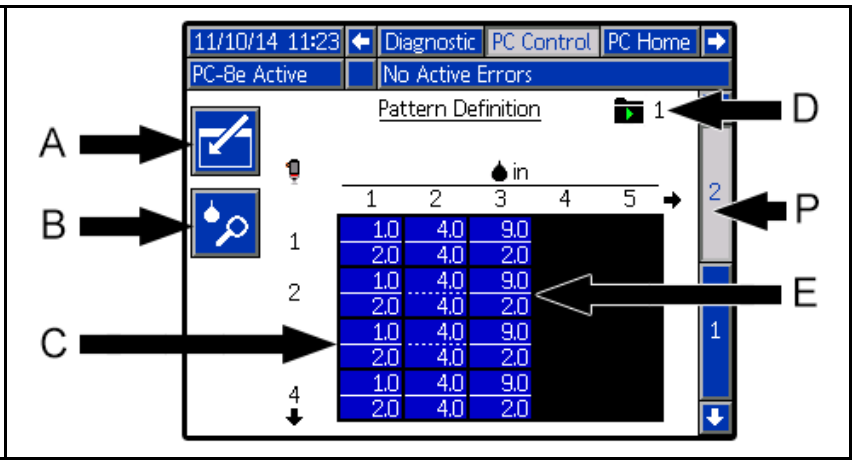
## Pattern Definition (Screen 2)

1. Enter start point and length of beads.
2. Enable or disable stitching for each bead.
3. Preview this pattern.

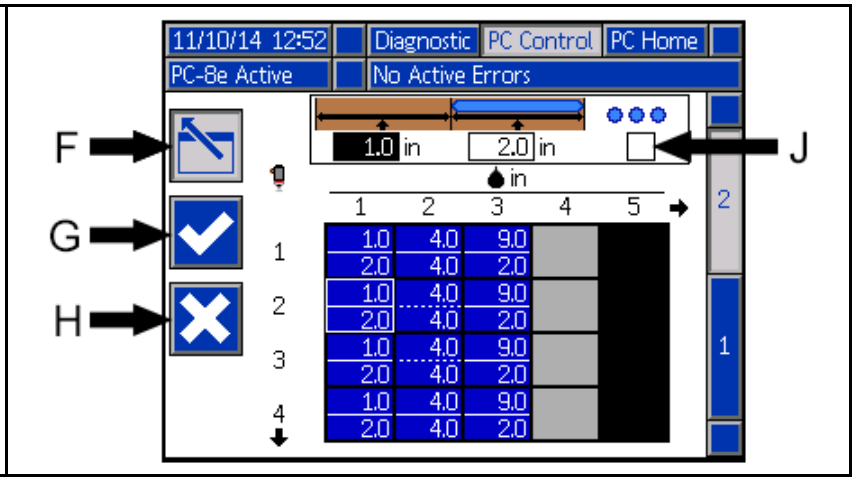
**NOTE:** To clone the pattern from gun A to gun B, navigate to any bead on gun B and press/hold the number key for gun A.

**NOTE:** Enter the screen and scroll down to see valves 5–8. Add beads and continue to scroll right to access beads 6–24.

**A** — Enter Screen
**B** — Pattern Preview
**C** — Dots = Stitched
Solid = Solid Bead
**D** — Current Program
**E** — Start of Bead / Bead Length
**P** — Screen Number (Screen 2)




**F** — Exit Screen
**G** — Confirm Changes
**H** — Cancel Changes
**J** — Stitch Bead




| Icon | Name | Description |
|---|---|---|
| | Bead Offset | Distance from the edge of the product to the start of the bead |
| | Bead Length | Length of the Bead |
| | Stitch Bead | Enable or disable stitching of this bead. |

## Pattern Preview

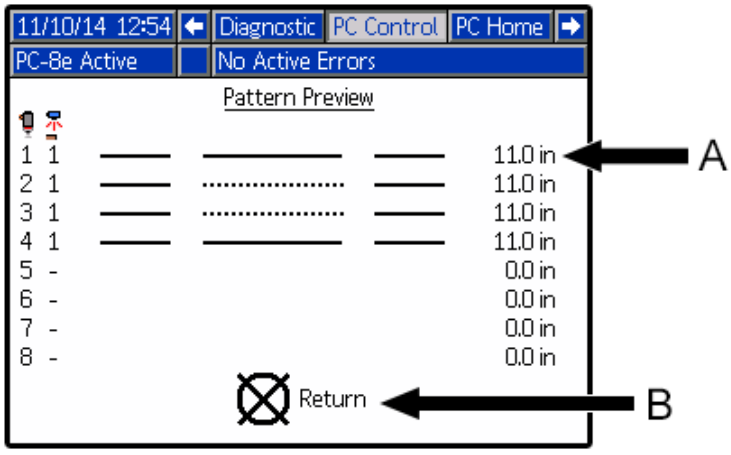
Read-only display of bead pattern.

**A** — Endpoint of Last Bead

**B** — Exit Preview

— Gun Number

— Trigger Number




**NOTE:** Dotted pattern shows stitching. The actual number of stitched beads is not represented.

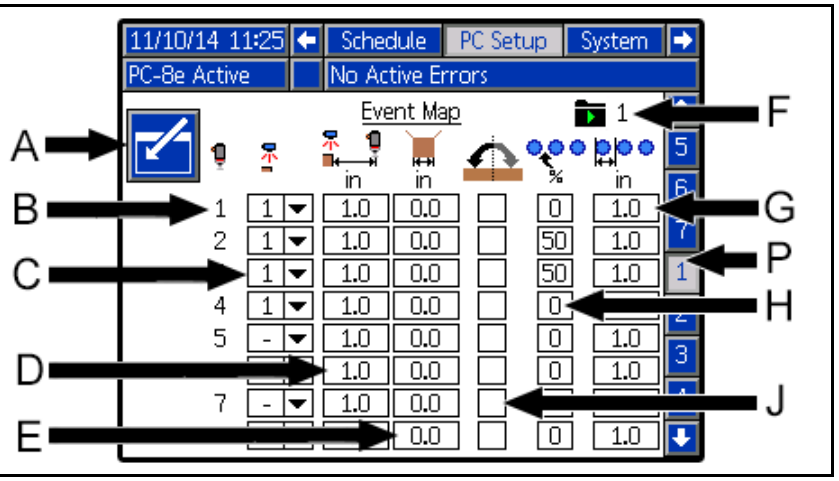
**NOTE:** A red dotted pattern indicates that the gun does not have a trigger selected (see Event Map (Screen 1), page 21).

## Event Map (Screen 1)

Enter configuration settings for this pattern:

1. Assign trigger to each gun.
2. Input gun-to-trigger offset.
3. Enter minimum product length (if false trigger pickup is a concern).
4. Enable pattern mirroring.
5. Enter stitch percentage and interval.

**A** — Enter Screen
**B** — Gun Number
**C** — Trigger for Gun
**D** — Gun to Trigger Offset
**E** — Minimum Product Length
**F** — Current Program
**G** — Stitch Interval
**H** — Stitch Savings
**J** — Mirror Pattern
**P** — Screen Number (Screen 1)

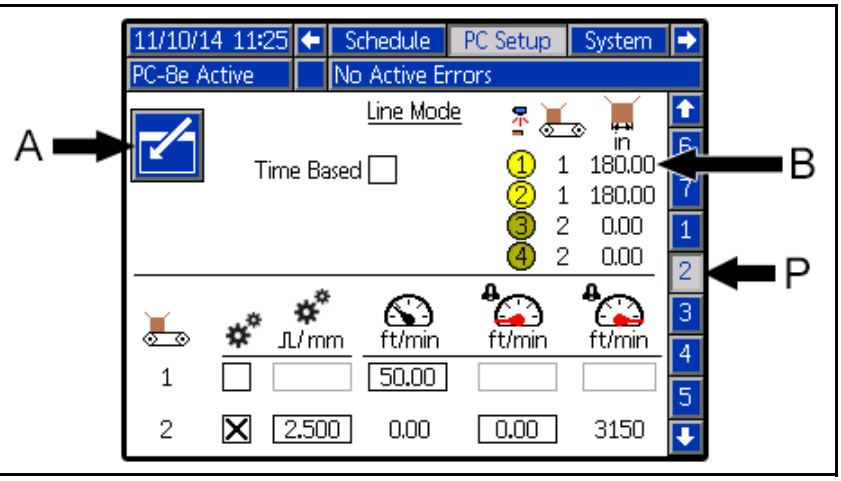



| Icon | Name | Description |
|---|---|---|
| | Trigger | Trigger associated with this gun |
| | Gun-to-Trigger Offset | The physical distance or time between the trigger and the gun. |
| | Minimum Product Length | Blocks triggers from activating a second pattern within the minimum product length |
| | Mirror Bead Pattern | Mirrors beads from the leading edge of the box to the trailing edge of the box. **NOTE:** If mirror mode is selected, the Gun-to-Trigger Offset must be at least half the length of the box (see Mirror Mode, page 33). |
| | Stitch Savings | Percentage of glue saved by stitching. Set to 0 to disable stitching. **NOTE:** Stitching must also be enabled/disabled for each bead (see Stitching, page 29). |
| | Stitch Interval | The distance between the start of each stitch. |

## Line Mode (Screen 2)

1. Select mode:
   a. Time based.
   b. Distance mode without encoder (uses fixed line speed).
   c. Distance mode with encoder.
2. For time mode, there are no additional settings.
3. For distance mode without encoder:
   a. Pass one product by the trigger at normal speed.
   **NOTE:** See trigger setup section if product is not tripping the trigger properly.
   b. Adjust line speed setting until length of last product is correct.
4. For distance mode with encoder.
   a. Verify positive line speed when line is moving forward. If speed is negative, swap A and A' with B and B' wires at the encoder connector on the Pattern Controller.
   b. Pass one product by the trigger.
   c. Adjust encoder pulses per mm until length of last product is correct.

**A** — Enter Screen
**B** — Last Box Length
**P** — Screen Number (Screen 2)

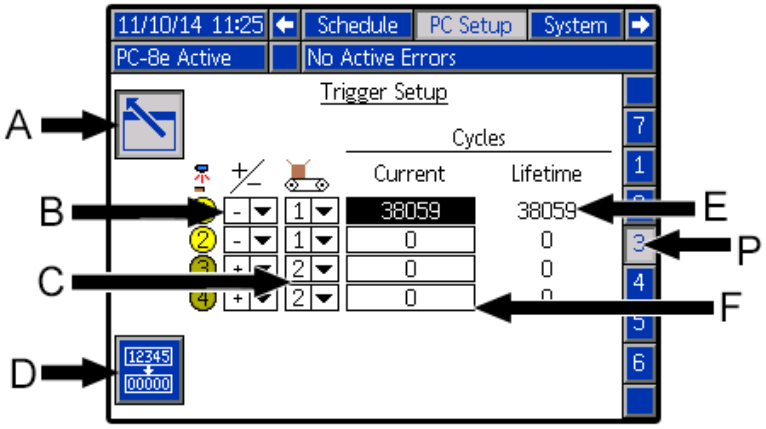



| Icon | Name | Description |
|---|---|---|
| Time Based | Time Mode Select | In time mode, programs settings are in units of milliseconds |
| | Line Number | Line number for other settings/values in a row |
| | Length of Last Product | Length of the last product seen by a trigger on the line.<br>**NOTE:** Value adjusts for changes in encoder/speed settings. |
| | Encoder | Select if encoder is to be used |
| | Encoder Pulses per mm | Pulses encoder generates per mm of line travel.<br>**NOTE:** 500ppr encoder, 200mm wheel = 2.5 pulses/mm. |
| | Low Line Speed Alarm | Outputs will not fire when the line is below this speed.<br>**NOTE:** A value of 0 disables this alarm. |
| | High Line Speed Alarm | Read-only: Maximum line speed allowed.<br>**NOTE:** The value is calculated from encoder pulses per mm. |
| | Line Speed | • If encoder enabled: view current line speed<br>• If encoder disable: enter fixed line speed |

## Trigger Setup (Screen 3)

1. Select Trigger Polarity :
   a. Trigger should show bright yellow when product is present and dark yellow for no product.
   b. If polarity is backwards, use the drop-down to invert the detection.
2. Select Trigger Line Number (PC-8e only):
   a. If product runs past all triggers at the same speed, select line 1.
   b. Where two line speed settings are required, select line 1 for triggers sensing from the first line speed and line 2 for the second.
3. Trigger Cycle Counters:
   a. View current and lifetime cycle counts of each trigger.
   b. Press soft key to reset current cycle count of selected trigger.

**A** — Enter Screen
**B** — Trigger Polarity
**C** — Line 1 or 2
**D** — Reset Selected Counter
**E** — Lifetime Trigger Count
**F** — Resettable Trigger Count
**P** — Screen Number (Screen 3)




| Icon | Name | Description |
|---|---|---|
| | Trigger Polarity | Toggle polarity to invert state of trigger signal |
| | Select Line | Select which line the trigger is sensing on (PC-8e only) |
| | Reset Counter | Reset trigger cycle count |

## General Setup (Screen 4)

1. Lock Pattern Definition (optional) — Protects pattern from accidental changes. Operator must enter a password to change patterns, and copy, delete, or rename programs.

   **NOTE:** This setting will only take effect if Run Screens are also locked (see Advanced Screens, page 27).

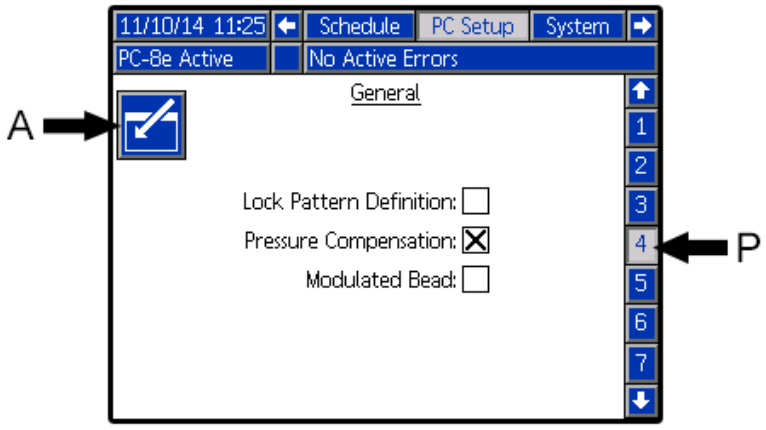
2. Enable Pressure Compensation (optional, PC-8e only):

   - Used to maintain consistent glue output with variable line speed.
   - With run-up kit installed, this feature adjusts pump pressure according to the output vs. speed curve. For run-up settings, see Run Up Installation (PC-8e only), page 12.

3. Enable Modulated Bead (optional, PC-8e only):

   - Used to maintain consistent glue output with variable line speed.
   - Adjusts output by stitching beads according to the output vs. speed curve.
   - When Pressure Compensation is enabled, modulated bead becomes active below the minimum output percentage.
   - When Pressure Compensation is disabled, modulated bead follows the output vs. speed curve. For run-up settings, see Run Up Installation (PC-8e only), page 12.

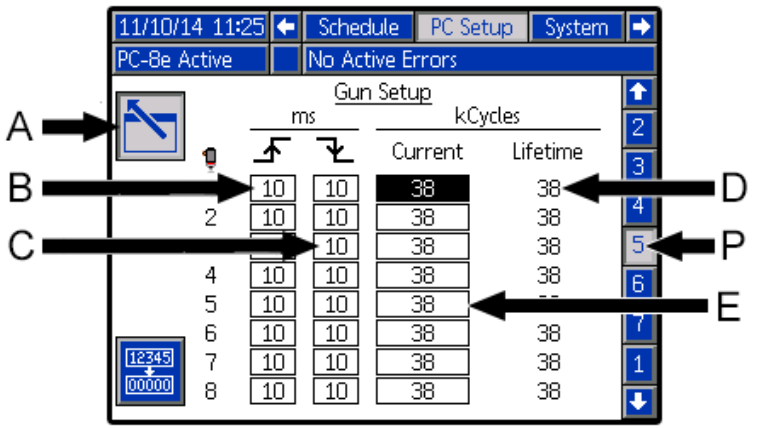
**A** — Enter Screen
**P** — Screen Number (Screen 4)



## Gun Setup (Screen 5)

1. Gun Compensation:
   - Enter gun open compensation .
   - Enter gun close compensation .
2. Gun Cycle Counters:
   - View current and lifetime cycle counts of each gun.
   - Press soft key 12345 / 00000 to reset current cycle counter of selected gun.

**A** — Enter Screen
**B** — Gun Open Compensation
**C** — Gun Close Compensation
**D** — Lifetime Gun Cycles
**E** — Resettable Gun Cycles
**P** — Screen Number (Screen 5)

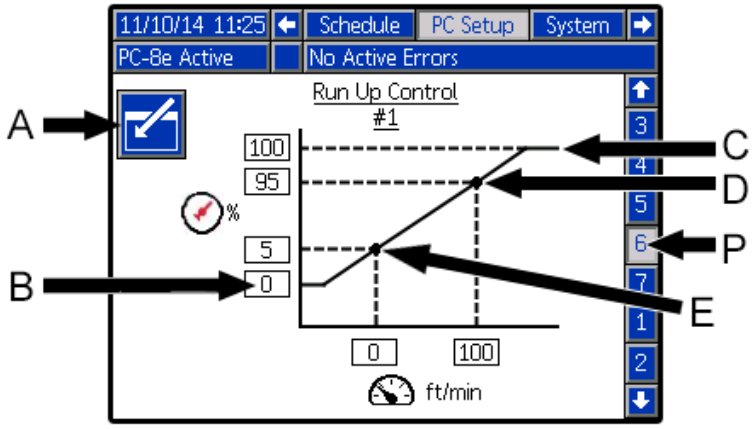



| Icon | Name | Description |
|---|---|---|
| | Open Compensation | Mechanical delay between electrical signal to gun and physical opening of gun |
| | Close Compensation | Mechanical delay between electrical signal to gun and physical closing of gun |
| 12345 / 00000 | Reset Counter | Reset gun cycle count |

## Run Up Control (Screens 6–7, PC–8e only)

- Enter run up output settings

**A** — Enter Screen
**B** — Minimum Output
**C** — Maximum Output
**D** — High Calibration Point
**E** — Low Calibration Point
**P** — Screen Number (Screen 6)

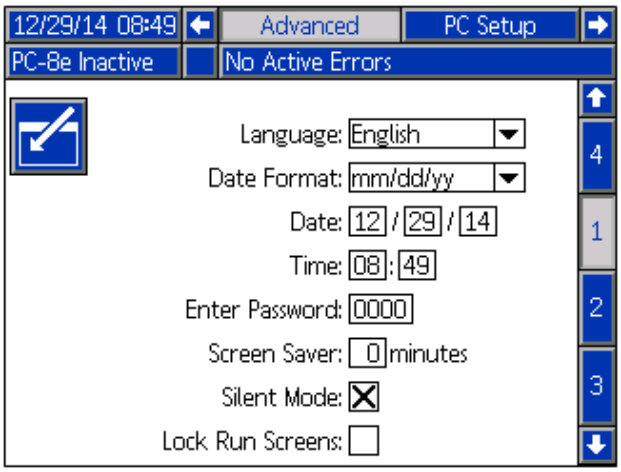



| Icon | Name | Description |
|---|---|---|
| | Output Pressure Percentage | Enter minimum and maximum pressure for run up control.<br>Enter corresponding pressure points for entered line speed points to set run up curve. |
| | Line Speed | Upper and Lower line speed points |
| | Run Up Pressure to Line Speed Curve | Curve is set by two points which are defined by the user. Upper and lower limits define bounds over which run-up will function linearly. |

# Advanced Screens

## Advanced — Display

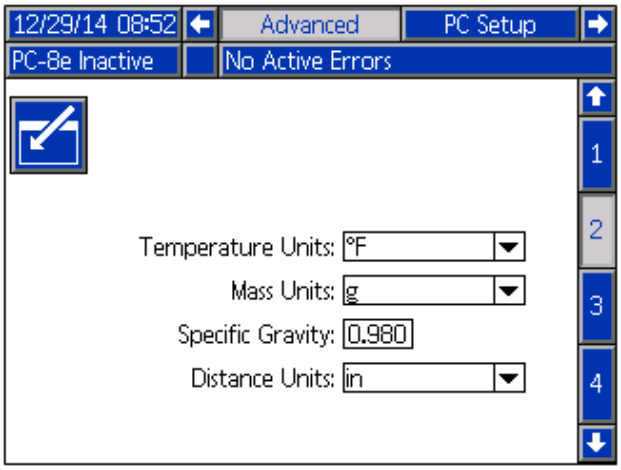
General display settings including language, time, and password protection.




| Name | Description |
|---|---|
| Language | Select the display language |
| Date Format | Select the display date format |
| Date | Enter the display date |
| Time | Enter the display time |
| Password | Enter the password to restrict access to Setup screens. **NOTE:** A value of “0000” does not require a password for access to setup screens. |
| Screen Saver | Enter the time-out for the display screen saver. **NOTE:** A value of “0” disables the screen saver. |
| Silent Mode | If selected, disables the display beep functionality. |
| Lock Run Screens | If selected, operators will not be able to change most run screen settings. **NOTE:** In order for this setting to have any effect, a password other than “0000” must be entered above. |

## Advanced — Units

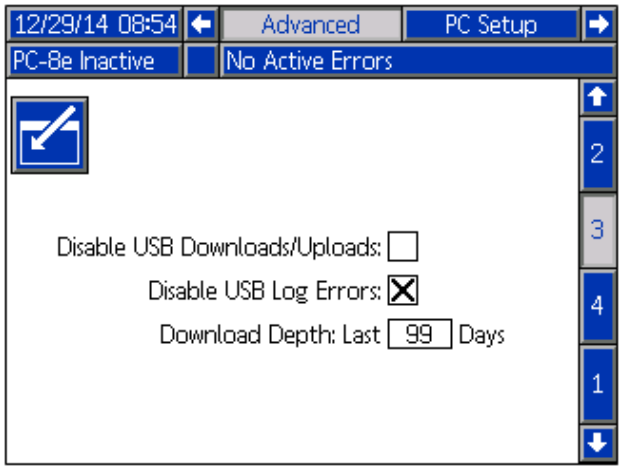
Select the system units to be used on the display.




| Name | Description |
|---|---|
| Temperature | Select the system temperature units (integrated systems only) |
| Mass Units | Select the system mass units (integrated systems only) |
| Specific Gravity | Enter the material specific gravity for higher precision adhesive consumption (integrated systems only) |
| Distance Units | Select the system distance units. **NOTE:** This setting applies to all pattern control distance values except when time based mode is selected on *PC Setup – Line Mode* (distance units become time units of milliseconds). |

## Advanced — USB Downloads Settings

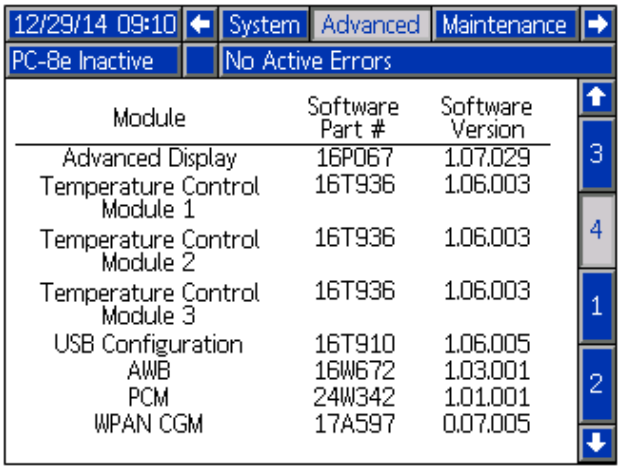
Select USB download settings.




| Name | Description |
|---|---|
| Disable USB Downloads / Uploads | Disables USB port from transmitting data to/from a USB drive |
| Disable USB Log Errors | Disables USB log advisory |
| Download Depth | Sets the length of the data logs to be downloaded (affects the download time) |

## Advanced — System Software

Read only display of system software.




| Name | Description |
|---|---|
| Module | Name of module in system |
| Software Part # | Part number of software installed on module |
| Software Version | Version of software installed on module |

**NOTE:** If software versions or part numbers do not match the expected values, see Software Update Procedure, page 40.

# Stitching

To maintain bond strength while reducing adhesive consumption..

## Definitions

**Sub-Bead —**

One dispense cycle of a stitched bead.

**Stitch Interval —**

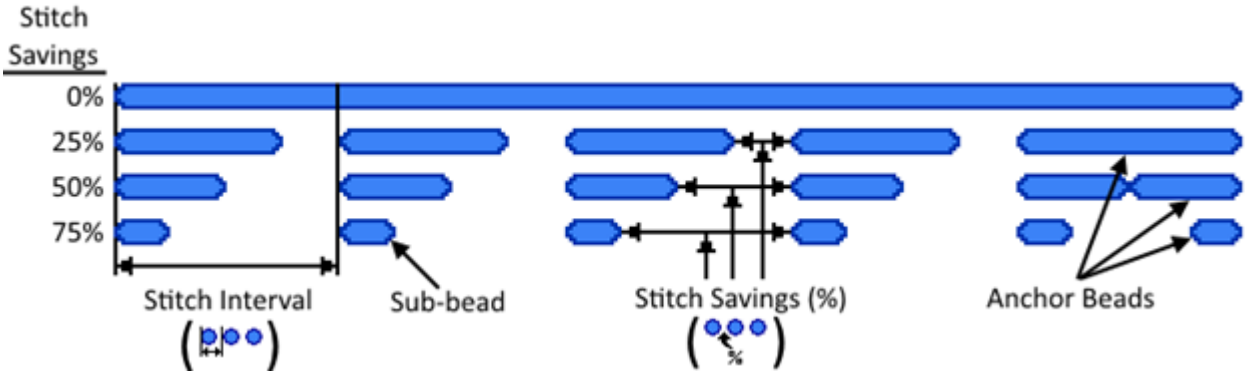
The distance between the starts of two adjacent sub-beads.

**Stitch Savings —**

The percentage of adhesive saved.

**Anchor Beads**

An anchor bead is a sub-bead placed at the end of the stitched bead that guarantees the stitched bead ends at the same location as the original (non-stitched) bead.



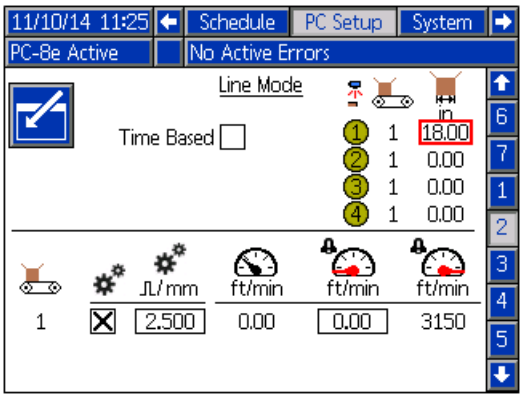

## Setup

In order to stitch any bead, perform the following steps:

1. Navigate to Event Map (Screen 1), page 21.
2. Enter the desired Stitch Interval and Stitch Savings for the desired gun. **NOTE:** Stitching can be disabled by setting the gun Stitch Savings to “0”.
3. Navigate to Pattern Definition (Screen 2), page 19.
4. Stitch individual beads by selecting the Stitch Bead option within each bead entry box. **NOTE:** Not all beads for a specific gun must be stitched (some can be stitched while others are solid).

# Line Speed

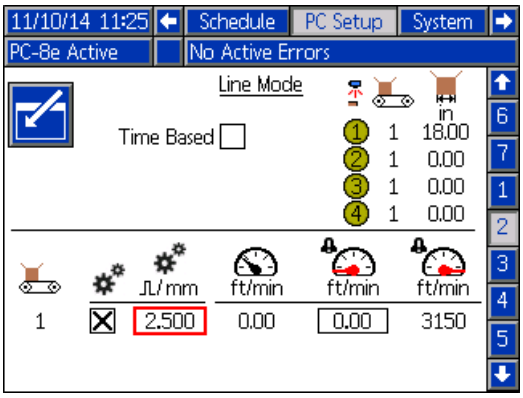
1. Navigate to Line Mode (Screen 2), page 22.
2. Pass a product of known length past the trigger in use.
3. Once the product has passed the trigger, note the value displayed in the *Last Product Length* indicator. **NOTE:** This value is the length of the part of the product that passes below the trigger in use, not necessarily the overall length of the product.



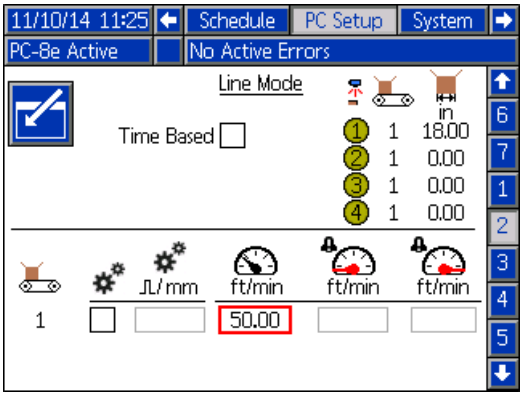

*Last Product Length* displayed for trigger is 18.00 inches long.

4. Adjust settings:
   a. On **encoder systems** (PC-8e only), adjust *Encoder Pulses per mm* ⎍/mm until the Last Product Length value matches the expected length.
   b. On fixed **line speed systems** (both versions), adjust *Fixed Line Speed* until the *Last Product Length* value matches the expected length.

**NOTE:** *Last Product Length* indicator will update according to the changes made in settings above (step 2 only needs to be performed once).




Encoder pulses per mm box.




Fixed Line Speed box.

# Run Up Control

## Run Up Setup

1. Verify run up controller range is set to 100 psi (10 V input signal yields 100 psi). **NOTE:** settings below assume input air pressure to the regulator is greater than or equal to 100 psi (simplifies run up programming so that % and psi values are interchangeable).
2. Navigate to General Setup (Screen 4), page 24, and disable Pressure Compensation.

## High Calibration Point

1. Turn system ON and run line at maximum speed.
2. Navigate to Line Mode (Screen 2), page 22, and note Current Line Speed in F below.
3. Set pressure using the pump pressure dial and gauge at the base of the InvisiPac system until the desired glue output is achieved.
4. Note pressure displayed on InvisiPac pump pressure gauge in **G** below.
5. Note pressure displayed on run up controller in **B** below.

## Low Calibration Point

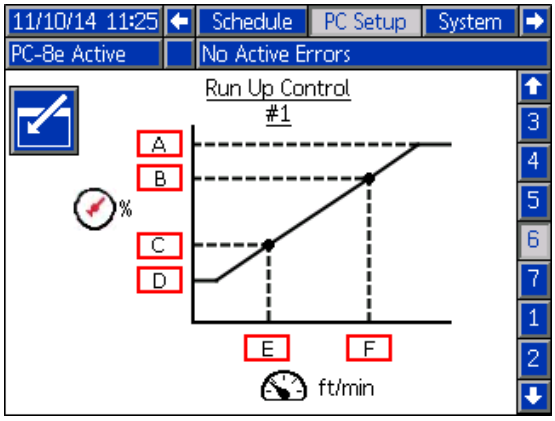
1. Reduce line speed to minimum speed and note Current Line Speed in **E** below.
2. Reduce pressure using the dial and gauge at the base of the InvisiPac system until the desired glue output is achieved. Note pressure displayed on regulator in **C** below.
3. Return pressure on InvisiPac pump pressure gauge to value in **G** below.

## User Setting Entry

1. Navigate to Run Up Control (Screens 6–7, PC–8e only), page 26. Enter settings in screenshot according to values in section below.
2. Navigate to General Setup (Screen 4), page 24 and re-enable Pressure Compensation.

## User Settings

| | | |
|---|---|---|
| **(A)** | Maximum output | _____100 % (psi) |
| **(B)** | Run up controller pressure at high line speed | _____ % (psi) |
| **(C)** | Run up controller pressure at low line speed | _____ % (psi) |
| **(D)** | Minimum output | _____50 % (psi) |
| **(E)** | Low line speed | _____ ft/min or m/min |
| **(F)** | High line speed | _____ ft/min or m/min |
| **(G)** | InvisiPac pump pressure at high line speed | _____ psi |




PC Setup — Run Up Control screen with settings indicated by the letters above.

## Random Length Bead Mode

For handling products of various lengths with one pattern

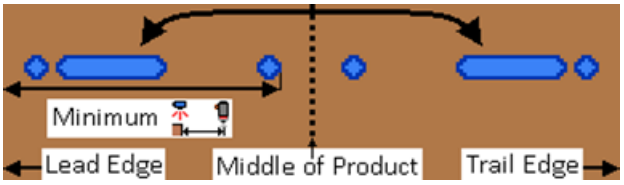
To use random length bead mode, perform the following steps:

1. Navigate to Event Map (Screen 1), page 21.
2. Select Mirror Bead Pattern for the desired gun.
3. Verify the appropriate Gun-Trigger Offset for the selected gun.

   **NOTE:** Gun-Trigger Offset must be greater than or equal to the leading margin.
4. Navigate to Pattern Definition (Screen 2), page 19.
5. Enter the leading margin (LM) in the bead 1 offset box. **NOTE:** The leading margin is equal to the trailing margin.
6. Enter the length of the longest random bead (LRB) that may be needed in the bead 1 length box.
7. Enable or disable stitching for bead 1.

## Mirror Mode

For symmetrical patterns, including products with varying lengths.




To use mirror mode, perform the following steps:

1. Navigate to Event Map (Screen 1), page 21.
2. Select Mirror Bead Pattern for the desired gun.
3. Verify Gun-Trigger Offset for the selected gun is greater than or equal to the end of the final bead (final bead offset + length).
4. Navigate to Pattern Definition (Screen 2), page 19.
5. Enter bead information for the first half of the product.
6. Enable or disable stitching for each bead.

# Calibration

## Gun Compensation (optional)

For high speed lines and precision applications.

**NOTE:** Before entering gun compensation values, ensure the appropriate gun-trigger offset values have been entered for each gun-trigger pair on Event Map (Screen 1), page 21.

Entering the appropriate gun compensation can ensure higher accuracy of bead placement. To ensure the appropriate values are entered, begin with the *Recommended Values* below and adjust according to the *Calibration Routine*.

**Recommended Values**
GM-100: 5-10 ms
GS-35: 10–20 ms
Unknown, other: 10 ms

**Calibration Routine**

1. Navigate to Gun Setup (Screen 5), page 25.
2. Dispense desired pattern (program contained within the Pattern Controller).
3. Measure distance between dispensed pattern (actual position of dispensed pattern on the product) and desired pattern.
4. Adjust Open/Close compensation values according to the following **Gun Compensation Table** and **Gun Compensation Formula** below.
5. Repeat steps 2-3 until desired pattern achieved.

**Gun Compensation Adjustment Guide:**

| Edge | Leading Edge | | Trailing Edge | |
|---|---|---|---|---|
| **Relative Position**<br>Desired:<br> <br>vs.<br>Dispensed:<br> | Lagging<br> | Leading<br> | Lagging<br> | Leading<br> |
| Adjustment | Increase<br> | Decrease<br> | Increase<br> | Decrease<br> |

**Gun Compensation Formula:**

Determine the gun compensation adjustment amount in milliseconds.

**Standard units:** $$\text{Adjustment (ms)} = \frac{5000 \times \text{Measured Offset Distance (in.)}}{\text{Line Speed (ft/min.)}}$$

**Metric units:** $$\text{Adjustment (ms)} = \frac{60 \times \text{Measured Offset Distance (mm)}}{\text{Line Speed (m/min.)}}$$

**Bead offset distances in inches (mm) as a function of Gun Compensation and Line Speed**

| Gun Compensation (ms) | Line Speed | | | | |
|---|---|---|---|---|---|
| | **50 ft/min 15.24 (m/min)** | **100 ft/min 30.48 (m/min)** | **200 ft/min 60.96 (m/min)** | **500 ft/min 152.4 (m/min)** | **1000 ft/min 304.8 (m/min)** |
| **5** | 0.05 in. 1.27 (mm) | 0.1 in. 2.54 (mm) | 0.2 in. 5.08 (mm) | 0.5 in, 12.7 (mm) | 1.0 in. 25.4 (mm) |
| **10** | 0.1 in. 2.54 (mm) | 0.2 in. 5.08 (mm) | 0.4 in. 10.16 (mm) | 1.0 in. 25.4 (mm) | 2.0 in. 50.8 (mm) |
| **20** | 0.2 in. 5.08 (mm) | 0.4 in. 10.16 (mm) | 0.8 in. 20.32 (mm) | 2.0 in. 50.8 (mm) | 4.0 in. 101.6 (mm) |

# Verification

This section verifies proper installation of the InvisiPac Pattern Control System. For further assistance, see Troubleshooting, page 36.

## Valves

1. Navigate to Gun Purge, page 18.
    a. With system ON: attempt a purge on each installed valve and verify that the valve is actuated (glue has been dispensed from the appropriate valve).
    b. With system OFF: disconnect the cable from the solenoid and attempt a purge on each installed valve and verify that the signal is actuated (via the LED on the valve connector).

## Triggers

1. Navigate to Home, page 16.
2. Without product in front of the trigger, verify that the trigger indicator LED is OFF.
3. With product in front of the trigger, verify that the trigger indicator LED is ON.

## Encoder

1. Navigate to Home, page 16.
2. Verify that the line speed displayed in the Current Line Speed indicator is positive and varies for different line speeds.
3. If the line speed shown does not match the known/expected value, see Calibration, page 34, to make the appropriate adjustments.

## Run Up Control

1. Navigate to Home, page 16.
2. Turn the system ON and wait for the Pattern Controller to become ACTIVE.
3. Run the line at various speeds and verify that the appropriate Run Up Output is displayed on the screen and the Run Up Controller is displayed (if pressure readout is available).
4. If the percentage/pressure displayed does not match the expected value, see Run Up Control (Screens 6–7, PC–8e only), page 26, to make the appropriate adjustments.

## PLC Inputs

1. Navigate to Home, page 16.
2. Actuate the PLC input remotely and verify that the expected result is indicated in the PLC IO section in the upper right corner of the display.

# Troubleshooting

## Error Codes

When error occur, press ↵ to acknowledge each error. After being acknowledged, the error will clear automatically when the condition that caused it is corrected. Active errors scroll on the menu bar

Alarms shut down the Pattern Controller and activate the dry contact PLC output. Advisories and deviations are informational only and do not shut the system down.

| Alarms (shut the system down) | | | |
|---|---|---|---|
| **Code** | **Description** | **Cause** | **Solution** |
| CAXP | Communication Error | ADM unable to communicate with Pattern Controller | Check for green power light on the Pattern Controller |
| | | | Check communication cabling |
| A40P | Overcurrent | Overcurrent on accessory power supply output | Check accessory cabling for short circuit |
| A4XP | Overcurrent | Overcurrent on communication cable output | Check ADM CAN cabling for short circuit |
| | | | Replace display (ADM) |
| A4_P | Overcurrent | Overcurrent on valve output "_" | Check wiring for short circuit |
| | | | Verify valve resistance is higher than 24 ohms |
| K4_P | High Pulse Rate | Encoder "_" pulse rate exceeds maximum limit | Select encoder with lower pulse rate |
| | | | Reduce line speed or gearing ratio |

| Advisories and Deviations (do not shut the system down) | | | |
|---|---|---|---|
| **Code** | **Description** | **Cause** | **Solution** |
| V1_P | Low Voltage | Power supply voltage below 18 VDC | To check for overloaded power supply, measure the voltage with all valves off, and then with all valves on (purging). |
| | | | To check for overheated power supply, allow the unit to cool and recheck voltage. |
| | | | Adjust voltage to 24 V if possible, or replace the power supply. |
| V4_P | High Voltage | Power supply voltage above 28 VDC | Adjust voltage to 24 V if possible or replace the power supply. |
| K1_P | Low Line Speed | Poor Encoder Coupling on line "_" | Check to ensure proper coupling between line and encoder. Verify Pattern controller is reading appropriate line speed (see Line Mode (Screen 2), page 22). |
| | | Line Speed is less than low line speed alarm level on line "_" | Increase line speed or decrease low line speed alarm level (see Line Mode (Screen 2), page 22). |

## Display

| Problem | Cause | Solution |
|---|---|---|
| Display does not turn on | Selector dial on Pattern Control board set to wrong position | Integrated Systems: set to 0<br>Stand-Alone Systems: set to 1 |
| | Power not turned on | Check for green light on Pattern Control board and Display |
| | Communication cable disconnected | Verify Pattern Control board is connected to Display |
| Pattern Control Screens not present | Selector dial on Pattern Control board set to wrong position | Integrated Systems: set to 0<br>Stand-Alone Systems: set to 1 |
| | Software version mismatch | Perform software update process with latest version of software (see Software Update Procedure, page 40). |
| Run Up Control Screens not present | PC-8e key token not inserted in ADM | Obtain PC-8e key token (comes with PC-8e versions of InvisiPac Pattern Control System) |
| Encoder settings not present | | |

## Pattern

| Problem | Cause | Solution |
|---|---|---|
| No pattern dispensed | Valve not associated with correct trigger (or not assigned to any trigger) | Ensure valve has appropriate trigger selected |
| | Physical problem with valve | See “No Glue Dispensed” troubleshooting help within *Valve* section |
| | Improper stitch settings | *Stitch Interval* too short or *Stitch Savings* too high |
| | Wrong/empty program selected | Ensure proper program is selected on *PC Control – Program Storage* (see Program Storage (Screen 1), page 17) and *PC Control – Pattern Preview* (see Pattern Preview, page 20) contains a pattern |
| | Pattern Controller not ACTIVE | Turn on pattern controller. Stand-Alone systems will go ACTIVE immediately, whereas Integrated systems will go ACTIVE once the InvisiPac system has gone ACTIVE |
| Pattern dispenses too early/late | Improper gun-trigger offset entered | Ensure appropriate *Gun-Trigger Offset* is entered on *PC Setup – Event Map* (see Event Map (Screen 1), page 21) |
| | Improper valve Open/Close Compensation / entered | Perform calibration routine found in *Calibration – Gun Compensation* (see Calibration, page 34) |
| Pattern measurement units are in distance/time | Improper line mode selected | Select appropriate line mode setting on *PC Setup – Line Mode* (see ##) |

## Valve

| Problem | Cause | Solution |
|---|---|---|
| System reset when guns fire | Current draw from combined valves exceeds power supply rating (150 W) | Ensure current draw is below 6A total between all simultaneously firing valves. |
| No glue dispensed | Solenoid shorted | Ensure proper wiring between solenoid and pattern controller. If no shorts found, consider replacing solenoid. |
| | Wrong type of valve in use | Pattern controller is only compatible with 24 VDC solenoids (no electric valves or AC solenoids) |

## Trigger

| Problem | Cause | Solution |
|---|---|---|
| Trigger always on/off | Sensor is covered/misaligned | Clear any sensor obstructions and verify sensor changes states with object present/absent |
| | Polarity is backwards | Change *Trigger Polarity* +/- in *PC Setup – Trigger Setup* (see Trigger Setup (Screen 3), page 23). |
| | Improper sensor type/installation | See *Installation – Trigger Installation* for proper sensor selection/installation |
| Trigger detects multiple times on one box | Trigger not adjusted properly or artifacts on the object being sensed cause false detection | Set *Minimum Product Length* in *PC Setup – Event Map* (see Event Map (Screen 1), page 21). |
| Trigger sensor turned off (no 24 VDC present) | Excessive current drawn from 24 VDC supply on | Perform power cycle to reset power to 24 VDC pins |
| | | If error persists, remove components and power cycle until component with excessive current draw is discovered |

## Encoder

| Problem | Cause | Solution |
|---|---|---|
| Encoder speed is negative | Encoder travel direction is reversed | Exchange A and A' wires with B and B' wires |
| | | Flip encoder to spin the opposite direction |
| Encoder speed varies significantly | Encoder coupling is slipping | Improve encoder coupling to line by using different bracket, mounting, coupling, etc. |
| Encoder reads wrong speed | Encoder is improperly scaled | Perform calibration routine found in *Calibration – Line Speed* (see Calibration, page 34). |
| | Encoder movement not proportionately scaled to path of product | Remount encoder to ensure ratio between encoder movement and product movement is always a fixed proportion |
| Encoder does not read line speed | Improper sensor type/installation | See *Installation – Encoder Installation* for proper sensor selection/installation |
| | Wrong line mode selected | Select encoder line mode setting on *PC Setup – Line Mode* (see Line Mode (Screen 2), page 22). |
| Line speed is fixed | Fixed line speed mode selected | Select Encoder line mode setting on *PC Setup – Line Mode* (see Line Mode (Screen 2), page 22). |

## Run Up

| Problem | Cause | Solution |
|---|---|---|
| Run Up Controller reads 0 psi | Integrated systems: InvisiPac system is INACTIVE<br>Stand-Alone systems: PC system is INACTIVE | Integrated systems: Turn system ON, run up will be active once system is ACTIVE (pump will turn on)<br>Stand-Alone systems: Turn system ON, run up controller will |
| | No pressure to inlet of run up controller | Ensure pressure is being supplied to the inlet of run up controller (check for valves and shutoffs upstream of controller) |
| Run Up Controller produces undesired results | Improper user settings entered | Perform calibration routine found in *Calibration – Run Up Control* (see Calibration, page 34). |
| | Output pressure desired is greater than inlet pressure | Ensure enough pressure is being supplied to the inlet of the run up controller (standard calibration routine calls for 100 psi) |

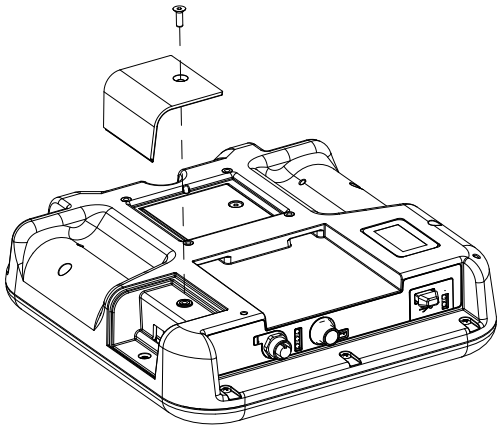
## PLC Inputs and Outputs

| Problem | Cause | Solution |
|---|---|---|
| Input from PLC not read by Pattern Controller | Improper input signal from PLC | See PLC Inputs and Outputs Installation (optional), page 11 for proper sensor selection/installation |
| | Broken wire | Check wiring between Pattern Controller and PLC |
| Output from Pattern Controller not read by PLC | Improper interface to PLC | See PLC Inputs and Outputs Installation (optional), page 11 for specifications and proper installation |
| | Broken wire | Check wiring between Pattern Controller and PLC |

# Software Update Procedure

When software is updated on the ADM the software is then automatically updated on all connected GCA components. A status screen is shown while software is updating to indicate progress.

1. Turn system main power switch OFF.
2. Remove ADM from bracket.
3. Remove token access panel.



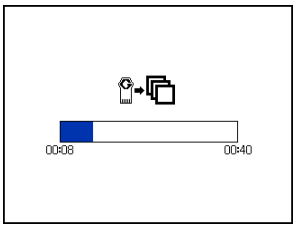
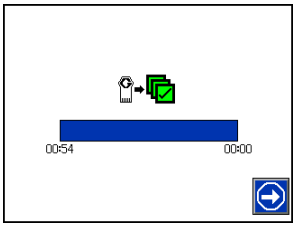
4. Insert and press InvisiPac software upgrade token (part no. 24R324) firmly into slot.

   **NOTE:** There is no preferred orientation of token.

5. Install ADM into bracket.
6. Turn system main power switch ON.

| *NOTICE* |
| --- |
| A status is shown while software is updating to indicate progress. To prevent corrupting the software load, do not remove token until the status screen disappears. |

**NOTE:** When the screen turns on, you will see the following screens:

| | |
| --- | --- |
| **First:**<br>Software is checking which GCA modules will take the available updates. | |
| **Second:**<br>Status of the update with approximate time until completion. |  |
| **Third:**<br>Updates are complete. Icon indicates update success/failure. See the following Icon table. |  |

| Icon | Description |
| --- | --- |
| | Update successful. |
| | Update unsuccessful. |
| | Update complete, no changes necessary. |
| | Update was successful/complete but one or more GCA modules did not have a CAN boot-loader so software was not updated on that module. |

7. Remove token (T).
8. Replace token access panel.
9. Press to continue to the InvisiPac operation screens.

# USB Download

The system can store 250,000 entries in its logs and the system adds a new entry to the logs every 15 seconds. This means the system stores 1041 hours of system operation data, or 43 days of around-the-clock operation. Once full, the system will overwrite the oldest data.

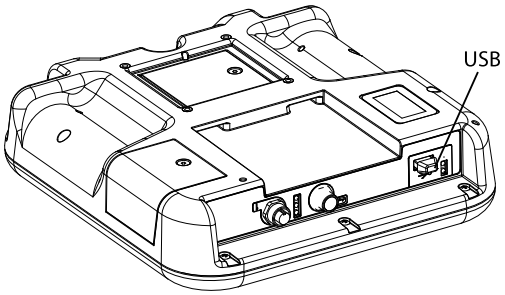
**NOTE:** To prevent losing any data, never go more than 43 days without downloading the logs.

## Download Procedure

| *NOTICE* |
| --- |
| Uploading an edited system configuration file can damage the system. Never put a modified SETTINGS.TXT file in the UPLOAD folder on the flash drive. |

1. Insert USB flash drive into USB port.

   **NOTE:** Flash drive must be 8 GB or smaller.




2. The menu bar and USB indicator lights indicate that the USB is downloading files. Wait for USB activity to complete. A pop-up will be present until the transfer is complete if it is not acknowledged.

**NOTE:** If the pop-up screen does not appear, the flash drive is not compatible with the ADM. Try a different flash drive.

**NOTE:** The system can log up to 45 mb of additional data per week, depending on system operation.

## Accessing Files

All files downloaded from the USB are put in a DOWNLOAD folder on the stick drive. For example: “E:\GRACO\12345678\DOWNLOAD\”. The 8-digit numeric folder name matches the 8-digit ADM serial number, which is located on the back of the ADM. When downloading from multiple ADMs, there will be one sub-folder in the GRACO folder for each ADM.

The log files should be opened in a spreadsheet program.

**NOTE:** If emailing the files, zip (compress) them to minimize file size.

## USB Logs

During operation, InvisiPac stores system and performance related information to memory in the form of log files. InvisiPac maintains the events, data, GCA, Black Box, and Diagnostics logs. Follow the **Download Procedure** to retrieve log files.

### Events Log

The event log (1-EVENT.CSV) maintains a record of the last 175,000 events. Each event record in the log file contains the date and time the event occurred, the event type, event code, and event description.

### Data Log

The data log (2-DATA.CSV) tracks the setpoint and actual temperatures every 15 seconds. This log can store up to 250,000 lines of data. The system stores 1041 hours of system operation data, or 43 days of around-the-clock operation. Once full, the system will overwrite the oldest data.

**NOTE:** To prevent losing any data, never go more than 43 days without downloading the logs.

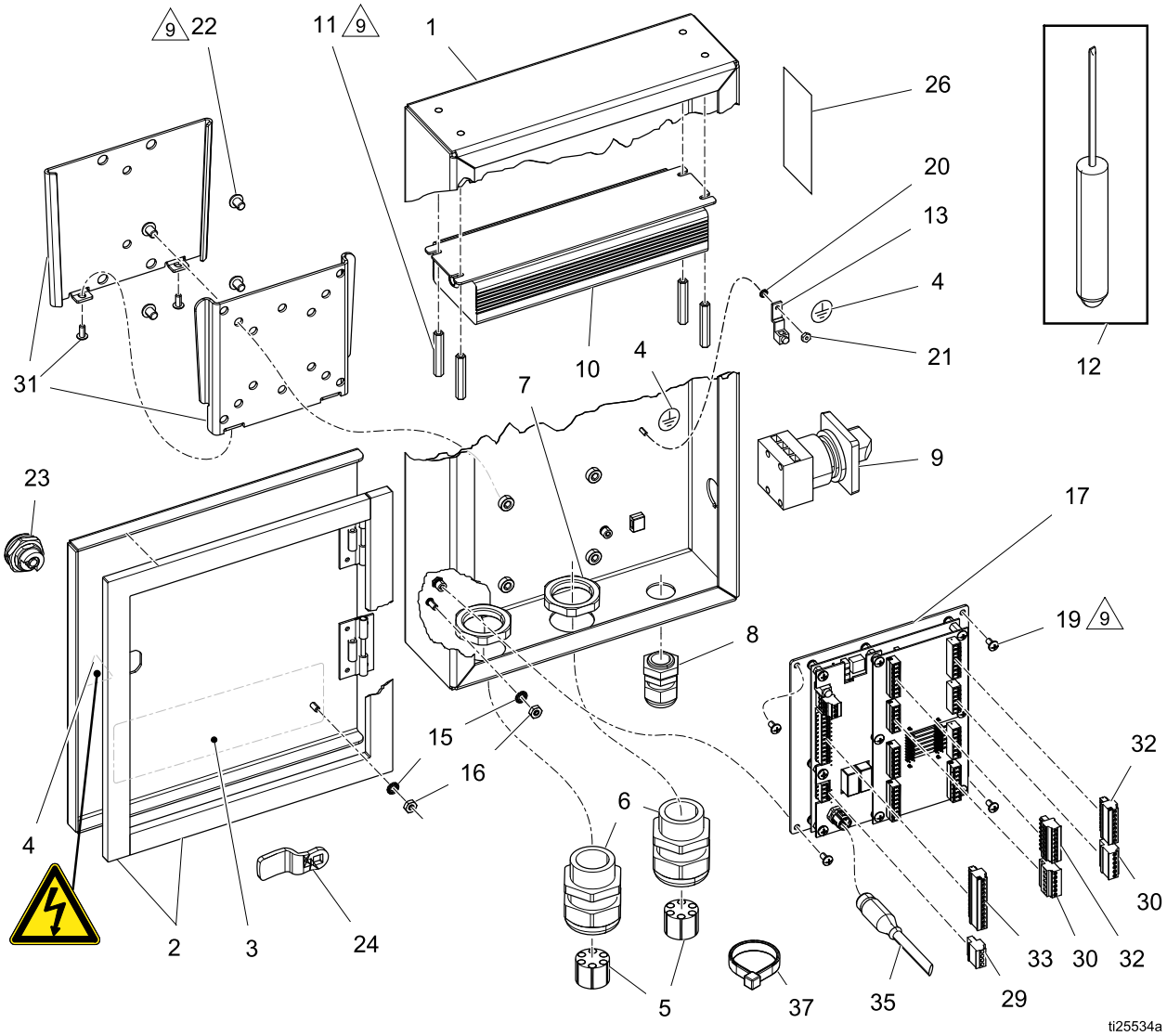
### GCA Log

This log (3-GCA.CSV) lists the installed GCA modules and their respective software versions.

### Black Box, Diagnostic Logs

These logs (4-BLACKB.CSV, 5-DIAGN.CSV) are designed to provide useful information to Graco when calling for technical assistance.

# Parts


9 22
11 9
1
26
20
13
4
21
12
31
10
4
7
9
23
17
19 9
8
15
16
6
32
4
30
2
3
24
33
30
32
5
37
35
29
ti25534a

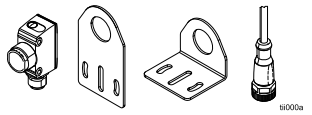
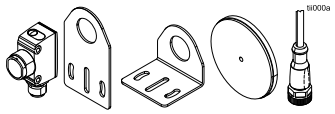
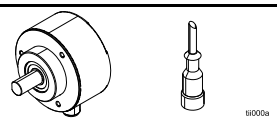
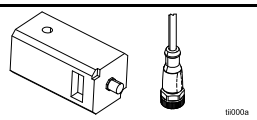
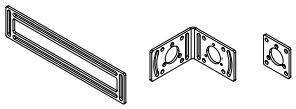
## Parts List

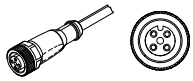
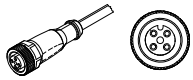
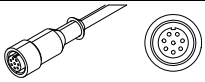
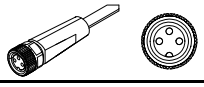
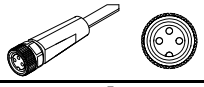
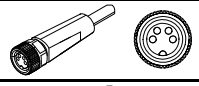
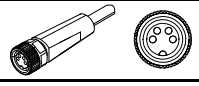
| Ref. | Part | Description | Qty. |
|---|---|---|---|
| 1 | | ENCLOSURE, PC, painted | 1 |
| 2 | | FOAM, gasket | 2 |
| 3 | | LABEL, pattern controller | 1 |
| ▲4 | | LABEL, symbol, ground | 1 |
| 5 | 127886 | GROMMET, pattern controller | 2 |
| 6 | 126881 | BUSHING, strain relief | 2 |
| 7 | 126891 | NUT, bushing | 2 |
| 8 | 114421 | BUSHING, strain relief | 1 |
| 11 | | FASTENER, hex, standoff | 4 |
| 12 | | TOOL, screwdriver | 1 |
| 13 | 127939 | BLOCK, ground | 1 |
| 15 | | WASHER, lock, ext | 2 |
| 16 | | NUT, #8–32 hex | 2 |
| 17 | 24W293 | MODULE, GCA, pattern control | 1 |
| 19 | | SCREW, machine, ph, 8 x 3/8 in. | 4 |
| 20 | | WASHER, lock | 1 |
| 21 | | NUT, hex | 1 |
| 22 | | WASHER, lock | 4 |
| 23 | | LATCH, tool, secured | 1 |
| 24 | | LATCH, cam | 1 |
| 25 | | SCREW, cap, hex hd | 4 |
| 26 | | BLANK, label kit | 1 |
| 29 | 116772 | CONNECTOR, plug, 3.81 mm, 4 position | 1 |
| 30 | 119162 | CONNECTOR, plug, 6 position | 2 |
| 31 | 128156 | BRACKET, mounting, slide-on | 1 |
| 32 | 128147 | CONNECTOR, plug, 3.81 mm, 8 position | 2 |
| 33 | 128117 | CONNECTOR, plug, 3.81 mm, 12 position | 1 |
| 35 | 127768 | CABLE, can, female 1.5 m | 1 |
| 37 | | TIE, cable, 7.5 in. | 1 |

▲ *Replacement Danger and Warning labels are available at no cost.*

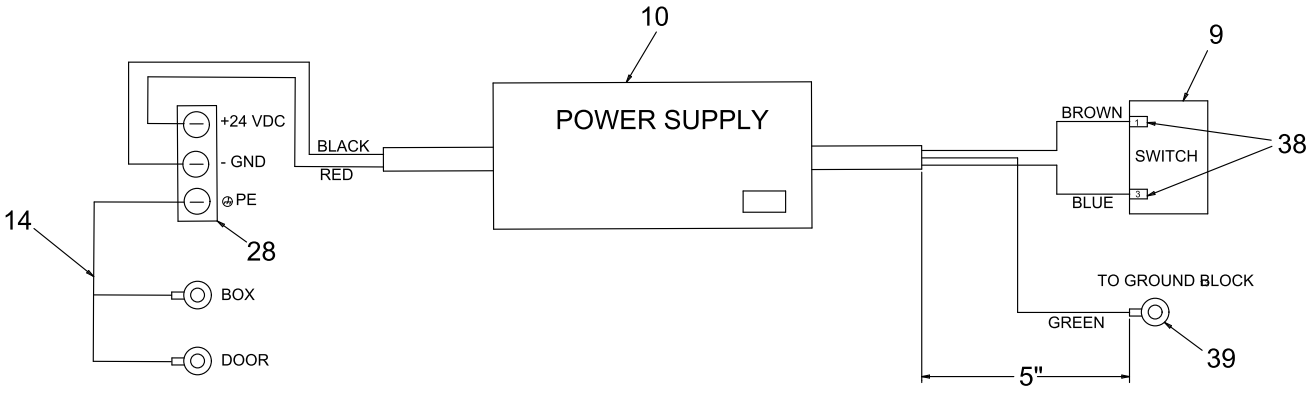
# Kits

## Kits List

| Part | Description | Contents | |
|---|---|---|---|
| 24X446 | KIT, photoeye, diffuse, 18mm | 128073 - SENSOR, photoelectric diffuse<br>128070 - BRACKET, sensor mount, angled<br>128071 - BRACKET, sensor mount, straight<br>128081 - CABLE, M12, 4-pin, 5.0 m |  |
| 24X447 | KIT, photoeye, pol ret ref, 18mm | 128072 - SENSOR, photoelectric, polarized<br>128069 - SENSOR, reflector<br>128070 - BRACKET, sensor mount, angled<br>128071 - BRACKET, sensor mount, straight<br>128081 - CABLE, M12, 4-pin, 5.0 m |  |
| 24X448 | KIT, encoder, 1000 PPR, 10mm | 128074 - ENCODER, incremental<br>128079 - CABLE, M12, 8-pin, 10.0 m |  |
| 17E020 | KIT, run up | 127787 - REGULATOR, pressure, V2P<br>128081 - CABLE, M12, 4–pin, 5.0 m<br>_____ - FITTINGS |  |
| 24X607 | KIT, encoder brackets | 17E017 - BRACKET, 90 degree, encoder<br>17E018 - BRACKET, encoder<br>17E037 - BRACKET, mounting, encoder |  |

| Part | Description | Used For | |
|---|---|---|---|
| 24X449 | KIT, cable, M12, 4-pin, F-L, 5 m | Standard solenoid valve (i.e. GS-35)<br>Run-up controller<br>Triggers with M12 connection (12mm nut) |  |
| 24X453 | KIT, cable, M12, 4-pin, F-L, 10 m | Standard solenoid valve (i.e. GS-35) Run-up controller Triggers with M12 connection (12mm nut) |  |
| 24X454 | KIT, cable, M12, 8-pin, F-L, 5 m | Encoder | |
| 24X455 | KIT, cable, M12, 8-pin, F-L, 10 m | Encoder |  |
| 24X456 | KIT, cable, M8, 3-pin, F-L, 5 m | Mini solenoid valve (i.e. GM-100) |  |
| 24X457 | KIT, cable, M8, 3-pin, F-L, 10 m | Mini solenoid valve (i.e. GM-100) |  |
| 24X458 | KIT, cable, M8, 4-pin, F-L, 5 m | Triggers with M8 connection (8mm nut) |  |
| 24X459 | KIT, cable, M8, 4-pin, F-L, 10 m | Triggers with M8 connection (8mm nut) |  |

# Wiring Diagram




ti25535a

| Ref. | Part | Description | Qty. | Ref. | Part | Description | Qty. |
|---|---|---|---|---|---|---|---|
| 9 | 15U423 | SWITCH, 2P, 25 A | 1 | 28 | | CONNECTOR, plug, 3 position | 1 |
| 10 | 127887 | POWER SUPPLY, 24 DC, 6.3 A, 150 W | 1 | 38 | | TERMINAL, fork, #8 | 2 |
| 14 | | HARNESS, ground | 1 | 39 | | TERMINAL, fork, #4 | 1 |

# Technical Data

| Description | Value | Details |
|---|---|---|
| **Gun Outputs** | 8 | 24 VDC, 1A each, 6A max total |
| **Trigger Inputs** | 4 | NPN or PNP or Dry Contact |
| **Encoder** | 2 (PC-8e only) | Quadrature differential line driver |
| **Run Up Control** | 2 (PC-8e only) | I/P (4–20mA) or V/P (0–10V) |
| **PLC Enable/Disable** | YES | 0–30 VDC, min 10V to assert |
| **PLC Program Select Bit** | 4 | Select up to 15 unique programs |
| **PLC Alarm Output** | YES | 0–250 VAC (dry contact output) |
| **Integrated Power Supply** | YES | Input: 100–240 VAC, 50/60 Hz<br>Output: 24 VDC, 150 W |
| **Program Storage** | 50 | |
| **Beads Per Output** | 24 | Each bead can be stitched, allowing many more than 24 dots |
| **Distance Accuracy** | 1mm, 0.1 in. | |
| **Time Accuracy** | 1ms | |
| **Enclosure Environmental Rating** | IP54 | Resistant to dust and splashing water |
| **Ambient Temperature** | 32˚ – 120˚ F, 0˚ – 50˚ C | |

# Notes

# Graco Standard Warranty

Graco warrants all equipment referenced in this document which is manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of twelve months from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

**THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.**

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within two (2) years of the date of sale.

**GRACO MAKES NO WARRANTY, AND DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, IN CONNECTION WITH ACCESSORIES, EQUIPMENT, MATERIALS OR COMPONENTS SOLD BUT NOT MANUFACTURED BY GRACO.** These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

FOR GRACO CANADA CUSTOMERS

The Parties acknowledge that they have required that the present document, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be drawn up in English. Les parties reconnaissent avoir convenu que la rédaction du présente document sera en Anglais, ainsi que tous documents, avis et procédures judiciaires exécutés, donnés ou intentés, à la suite de ou en rapport, directement ou indirectement, avec les procédures concernées.

## Graco Information

For the latest information about Graco products, visit www.graco.com.

For patent information, see www.graco.com/patents.

**To place an order,** contact your Graco Distributor or call to identify the nearest distributor.

**Phone:** 612-623-6921 **or Toll Free:** 1-800-328-0211 **Fax:** 612-378-3505

All written and visual data contained in this document reflects the latest product information available at the time of publication.

Graco reserves the right to make changes at any time without notice.

Original Instructions. This manual contains English. MM **334784**

**Graco Headquarters:** Minneapolis

**International Offices:** Belgium, China, Japan, Korea

**GRACO INC. AND SUBSIDIARIES • P.O. BOX 1441 • MINNEAPOLIS MN 55440-1441 • USA**

**Copyright 2014, Graco Inc. All Graco manufacturing locations are registered to ISO 9001.**

www.graco.com

Revision A, January 2015